

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

Claims 1-2 (canceled)

Claim 3 (currently amended): The X-ray apparatus according to claim 2, A digital X-ray scanning apparatus (1) comprising an X-ray source (2), an X-ray collimator (3), an X-ray detector (14), mounting means (9-11) for mounting the X-ray detector (14), scanning means (12, 7) for scanning (8b, 27) the X-ray detector (14) over an area (5), means (16) for digital data acquisition from the X-ray detector (14) and a control unit (2c) for steering the X-ray apparatus (1), wherein

the mounting and scanning means (9-12, 7) comprise additional means (13, 15) for orienting (8c) the X-ray detector (14) in at least one dimension towards the X-ray source (2) during a digital scanning procedure,

an orienting movement (8c) and a scanning movement (8b, 27) are independent degrees of freedom of the X-ray detector (14) and

the X-ray apparatus (1) can steer the orienting movement (8c) of the X-ray detector (14) in coordination with the scanning movement (8b, 27) of the X-ray detector (14);

the mounting and scanning means (9-12, 7) comprise translational means (11, 12) for moving the X-ray detector (14) along a straight line segment (8b, 27) or along a curved or circular line segment,

the additional means (13, 15) comprise rotational means (13, 15) for tilting (8c) the X-ray detector (14) in order to maintain a constant aspect ratio of the X-ray detector (14) as

viewed from the X-ray source (2), and

the X-ray detector (14) is a single- or multi-line digital X-ray detector (14);

characterized in that

- a) the translational means (11) is a carriage (11) that is movable in a direction perpendicular to its lateral extension,
- b) the rotational means (13) is a rotatable plate (13) that is mounted on the carriage (11) and ~~is designed for receiving~~ receives the X-ray detector (14), and
- c) ~~in particular that~~ the rotatable plate (13) is laterally extended for receiving an elongated single-line digital X-ray detector (14) suitable for partial or full body X-ray scanning (8a, 8b, 27).

Claim 4 (currently amended): The X-ray apparatus (1) according to claim 2, characterized in that A digital X-ray scanning apparatus (1) comprising an X-ray source (2), an X-ray collimator (3), an X-ray detector (14), mounting means (9-11) for mounting the X-ray detector (14), scanning means (12, 7) for scanning (8b, 27) the X-ray detector (14) over an area (5), means (16) for digital data acquisition from the X-ray detector (14) and a control unit (2c) for steering the X-ray apparatus (1), wherein

the mounting and scanning means (9-12, 7) comprise additional means (13, 15) for orienting (8c) the X-ray detector (14) in at least one dimension towards the X-ray source (2) during a digital scanning procedure,

an orienting movement (8c) and a scanning movement (8b, 27) are independent degrees of freedom of the X-ray detector (14) and

the X-ray apparatus (1) can steer the orienting movement (8c) of the X-ray detector (14) in coordination with the scanning movement (8b, 27) of the X-ray detector (14);

the mounting and scanning means (9-12, 7) comprise translational means (11, 12) for

moving the X-ray detector (14) along a straight line segment (8b, 27) or along a curved or circular line segment,

the additional means (13, 15) comprise rotational means (13, 15) for tilting (8c) the X-ray detector (14) in order to maintain a constant aspect ratio of the X-ray detector (14) as viewed from the X-ray source (2), and

the X-ray detector (14) is a single- or multi-line digital X-ray detector (14); further comprising

a) a housing (10) for receiving the translational and rotational means (11, 13) is provided, which housing (10) can be kept stationary during the scanning movement (8b, 27) and

b) in particular that wherein the mounting and scanning means (9-12, 7) comprise means (9, 7) for repositioning the housing (10) for different scanning procedures.

Claim 5 (currently amended): ~~The X-ray apparatus (1) according to claim 1,~~

A digital X-ray scanning apparatus (1) comprising an X-ray source (2), an X-ray collimator (3), an X-ray detector (14), mounting means (9-11) for mounting the X-ray detector (14), scanning means (12, 7) for scanning (8b, 27) the X-ray detector (14) over an area (5), means (16) for digital data acquisition from the X-ray detector (14) and a control unit (2c) for steering the X-ray apparatus (1), wherein

the mounting and scanning means (9-12, 7) comprise additional means (13, 15) for orienting (8c) the X-ray detector (14) in at least one dimension towards the X-ray source (2) during a digital scanning procedure,

an orienting movement (8c) and a scanning movement (8b, 27) are independent degrees of freedom of the X-ray detector (14) and

the X-ray apparatus (1) can steer the orienting movement (8c) of the X-ray detector (14) in coordination with the scanning movement (8b, 27) of the X-ray detector (14);

characterized in that by

- a) means for swiveling (8d) the X-ray source (2) and the collimator (3, 3a) in coordination with the scanning movement (8b, 27) and orienting movement (8c) of the X-ray detector (14) ~~are provided~~ and
- b) ~~in particular that~~ a balanced suspension of the X-ray source (2) and the collimator (3, 3a) for a torque-free swiveling movement (8d) ~~is provided~~.

Claim 6 (currently amended): ~~The X-ray apparatus (1) according to claim 1, A digital X-ray scanning apparatus (1) comprising an X-ray source (2), an X-ray collimator (3), an X-ray detector (14), mounting means (9-11) for mounting the X-ray detector (14), scanning means (12, 7) for scanning (8b, 27) the X-ray detector (14) over an area (5), means (16) for digital data acquisition from the X-ray detector (14) and a control unit (2c) for steering the X-ray apparatus (1), wherein~~

the mounting and scanning means (9-12, 7) comprise additional means (13, 15) for orienting (8c) the X-ray detector (14) in at least one dimension towards the X-ray source (2) during a digital scanning procedure,

an orienting movement (8c) and a scanning movement (8b, 27) are independent degrees of freedom of the X-ray detector (14) and
the X-ray apparatus (1) can steer the orienting movement (8c) of the X-ray detector (14) in coordination with the scanning movement (8b, 27) of the X-ray detector (14);

characterized in that by

- a) a motor drive unit (15) ad mechanical coupling means (23) ~~are provided~~ for synchronously driving the scanning movement (8b, 27) and the orienting movement (8c) of the X-ray detector (14) and a translational or swiveling movement (27; 8a, 8d) of the X-ray source (2) ~~or, wherein the X-ray apparatus has~~

moving parts and

b) several motor drive units (15) and an electrical control means (2e) for driving and synchronizing the scanning movement (8b, 27) and the orienting movement (8c) of the X-ray detector (14) and a translational or swiveling movement (27; 8a, 8d) of the X-ray source (2) are provided and in particular that sliding clutches are provided are mounted between the at least one motor drive unit (15) and moving parts (2,3,4,9,10) of the X-ray apparatus (1).

Claim 7 (currently amended): A digital X-ray scanning apparatus (1) according to claim 1, A digital X-ray scanning apparatus (1) comprising an X-ray source (2), an X-ray collimator (3), an X-ray detector (14), mounting means (9-11) for mounting the X-ray detector (14), scanning means (12, 7) for scanning (8b, 27) the X-ray detector (14) over an area (5), means (16) for digital data acquisition from the X-ray detector (14) and a control unit (2c) for steering the X-ray apparatus (1), wherein

the mounting and scanning means (9-12, 7) comprise additional means (13, 15) for orienting (8c) the X-ray detector (14) in at least one dimension towards the X-ray source (2) during a digital scanning procedure,

an orienting movement (8c) and a scanning movement (8b, 27) are independent degrees of freedom of the X-ray detector (14) and

the X-ray apparatus (1) can steer the orienting movement (8c) of the X-ray detector (14) in coordination with the scanning movement (8b, 27) of the X-ray detector (14);

comprising an X-ray source (2), an X-ray collimator (3), an X-ray detector (14), mounting means (9-11) for mounting the X-ray detector (14), scanning means (12, 7) for scanning (8b, 27) the X-ray detector (14) over an area (5), means (16) for digital data acquisition from the X-ray detector (14) and a control unit (2e) for steering the X-ray

apparatus (1), wherein additional photographic X-ray imaging means (2, 3, 4) comprising a cassette holder (4) for photographic films are provided, characterized in that

a) the mounting means (9-11) comprise a housing (10) that is designed for receiving receives the X-ray detector (14) and the cassette holder (4) in such a way that the X-ray detector (14) and the photographic film are facing towards different side faces of the housing (10) and

b) the mounting means (9-11) are designed for performing perform a reorienting movement (8z) of the housing (10) such that either the film cassette (4) or the X-ray detector (14) is positioned for X-ray imaging.

Claim 8 (currently amended): The X-ray apparatus (1) according to claim 7, characterized in that

a) the housing (10) is adapted for receiving receives the X-ray detector (14) on a front side (24) and the cassette holder (4) on a back side (25) and

e) the mounting means (9-11) has an axis (z) for rotating the front side (24) or the back side (25) of the housing (10) towards an X-ray source (2).

Claim 9 (currently amended): The X-ray apparatus (1) according to claim 7, characterized in that

a) the same X-ray source (2) is used for both digital and photographic X-ray imaging and/or

b) the X-ray collimator (3) is removable or a slit (3a) is openable for photographic X-ray imaging and/or and

e) the X-ray collimator (3) or the slit (3a) is steered automatically, in particular by means selected from the group consisting of a sensor indicating the presence of a photographic film in the cassette holder (4) and/or by, a switch in the cassette holder

(4) and/or by, a sensor indicating an orientation of the housing (10) for either digital or photographic X-ray imaging and/or by, a manual switch and/or by means of and software.

Claims 10-16 (canceled)

Claim 17 (currently amended): The X-ray apparatus (1) according to claim 1, A digital X-ray scanning apparatus (1) comprising an X-ray source (2), an X-ray collimator (3), an X-ray detector (14), mounting means (9-11) for mounting the X-ray detector (14), scanning means (12, 7) for scanning (8b, 27) the X-ray detector (14) over an area (5), means (16) for digital data acquisition from the X-ray detector (14) and a control unit (2c) for steering the X-ray apparatus (1), wherein

a) the mounting and scanning means (9-12, 7) comprise additional means (13, 15) for orienting (8c) the X-ray detector (14) in at least one dimension towards the X-ray source (2) during a digital scanning procedure,

b) wherein an orienting movement (8c) and a scanning movement (8b, 27) are independent degrees of freedom of the X-ray detector (14) and

the X-ray apparatus (1) can steer the orienting movement (8c) of the X-ray detector (14) in coordination with the scanning movement (8b, 27) of the X-ray detector (14);

characterized in that for full or partial body digital X-ray imaging by distance ranges 900 mm < d₁ < 1450 mm, 500 mm < d₂ < 900 mm and 10 mm < d₃ < 200 mm are provided for full or partial body digital X-ray imaging, where d₁=distance between the X-ray source (2) and the X-ray detector (14), d₂=distance between the X-ray collimator slit (3a) and the X-ray detector (14) and d₃=distance between the patient (5) and the X-ray detector (14).

Claim 18 (currently amended): The X-ray apparatus (1) according to claim 1, A digital X-ray scanning apparatus (1) comprising an X-ray source (2), an X-ray collimator (3), an X-ray

detector (14), mounting means (9-11) for mounting the X-ray detector (14), scanning means (12, 7) for scanning (8b, 27) the X-ray detector (14) over an area (5), means (16) for digital data acquisition from the X-ray detector (14) and a control unit (2c) for steering the X-ray apparatus (1), wherein

the mounting and scanning means (9-12, 7) comprise additional means (13, 15) for orienting (8c) the X-ray detector (14) in at least one dimension towards the X-ray source (2) during a digital scanning procedure,

wherein an orienting movement (8c) and a scanning movement (8b, 27) are independent degrees of freedom of the X-ray detector (14) and

the X-ray apparatus (1) can steer the orienting movement (8c) of the X-ray detector (14) in coordination with the scanning movement (8b, 27) of the X-ray detector (14);

characterized in that

a) a supporting arm (9) ~~for carrying~~ carries the X-ray source (2), the X-ray collimator (3) and a housing (10) for the detector (14) is provided and

b) the supporting arm (9) is rotatable and the X-ray source (2) together with the X-ray collimator (3) and the housing (10) for the detector (14) are tiltable with respect to the supporting arm (9) in order to position the X-ray source (2), the X-ray collimator (3) and the detector (14) for X-raying a standing, sitting or lying patient (5).

Claim 19 (currently amended): The X-ray apparatus (1) according to claim 18, characterized in that the X-ray source (2) and/or the housing (10) for the X-ray detector (14) are movable along the supporting arm (9) for selecting a distance d_1 between the X-ray source (2) and the X-ray detector (14) or, ~~in particular~~, a photographic film in a cassette holder (4) contained in the housing (10).

Claim 20 (currently amended): The X-ray apparatus (1) according to claim 18,

characterized in that

- a) the supporting arm (9) has a suspension that is movable horizontally (27) for X-raying a lying patient and/or,
- b) the supporting arm (9) has a suspension that is movable vertically (27) for X-raying a standing or sitting patient and/or, and
- c) the supporting arm (9) is rotatable by at least 90° in order to switch between X-raying a standing or sitting and a lying patient (5).

Claim 21 (New): A digital X-ray scanning apparatus (1) comprising an X-ray source (2), an X-ray collimator (3), an X-ray detector (14), mounting means (9-11) for mounting the X-ray detector (14), scanning means (12, 7) for scanning (8b, 27) the X-ray detector (14) over an area (5), means (16) for digital data acquisition from the X-ray detector (14) and a control unit (2c) for steering the X-ray apparatus (1), wherein

the mounting and scanning means (9-12, 7) comprise additional means (13, 15) for orienting (8c) the X-ray detector (14) in at least one dimension towards the X-ray source (2) during a digital scanning procedure,

an orienting movement (8c) and a scanning movement (8b, 27) are independent degrees of freedom of the X-ray detector (14) and

the X-ray apparatus (1) can steer the orienting movement (8c) of the X-ray detector (14) in coordination with the scanning movement (8b, 27) of the X-ray detector (14); characterized by

several motor drive units (15) and an electrical control means (2c) for driving and synchronizing the scanning movement (8b, 27) and the orienting movement (8c) of the X-ray detector (14) and a translational or swiveling movement (27; 8a, 8d) of the X-ray source (2), wherein the X-ray apparatus has moving parts and

Patent
0796/66435

sliding clutches are mounted between at least one motor drive unit (15) and the moving parts (2,3,4,9,10) of the X-ray apparatus (1).